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Watermarking in Speech Signal Using Least Significant Bit Technique

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Abstract: This study presents a novel invisible robust watermarking scheme for embedding and extracting a digital watermark in an image. The novelty lies in determining a perceptually important sub-image in the host image. Invisible insertion of the watermark is performed in the most significant region of the host image such that tampering of that portion with an intention to remove or destroy will degrade the esthetic quality and value of the image. This study describes our study that extended our watermarking using Least Significant Bit (LSB) technique applied it to images to embed and extract a speech signal. At last Peak Signal to Noise Ratio (PSNR) is calculated.

Key words: Watermarking, LSB technique, quality, scheme, image, quality

INTRODUCTION

Digital watermarking is a method to hide some information that is integrated with a multimedia object. The object may be any form of multimedia such as, image, audio, video or text. An approach fornon-saliency guided watermarking is discussed by Gawish *et al.* (2016). There are three advantages are existed: imperceptibility of the watermark is increased, robustness to various attacks with powerful features and watermarking capacity is increased using non-saliency heterogeneity-brightness spectrum. Frequency domain based digital image watermarking is presented by Pardhu and Perli (2016). Embedding process is based on Discrete Wavelet Transform (DWT) and Discrete Continuous Transform (DCT) in a multi resolution way. Finally, correlation PSNR is calculated. DCT based audio watermarking is described by Milas *et al.* (2016). Probability density function is believed for embedding process. The proposed method ensures optimal detection for weak watermarks. At last, SNR is measured based on performance.

Audio watermarking based on enhancement in time-spread echo is explained by Natgunanathan *et al.* (2016). To progress the robustness and the embedding capacity, the robustness, designed an efficient pseudo noise sequence and anequivalent decoding function. The decoding function is designed to develop these peaks to develop the robustness.

Blind audio watermarking using DWT-DCT based on Arnold scrambling and cyclic codes is discussed by Joshi (2016). Error correction technique and Arnold transform are used to get better the algorithm performance. Bit error rate, PSNR and structural similarity index are used to measure the performance between the original and extracted watermark. Scenarios of multiple re-watermarking are explained by Kampfer *et al.* (2006). Usefulness blind and non-blind algorithms comparison is particularly focussed. Both of the approaches are used for embedding process with more number of watermarks. Routing Algorithm for Mobility (SE_DREAM) (Shanthi and Anita, 2016) in MANETs intended for secure and efficient distance effect. Secure cloud storage system based on encryption techniques is surveyed by Kirubakaramoorthi *et al.* (2015).

Proposed system: The proposed system uses the LSB techniquefor watermarking an audio signal. Invisible insertion of the watermark is performed in the most significant region of the host image. Then, extract or separate a signal from original image.

Algorithm:

Input: Message data
Output: Visible watermarked image
Step 1: Read in the cover object you want to use for embedding.
Step 2: Read the message signal you want to hide in the cover image
Step 3: Determine the size of cover image used for embedding
Step 4: Determine the size of message object to embed
Step 5: Set the MSB or 8th bit of cover object (ii, jj) to the value of the MSB of watermark (ii, jj)
Step 6: Write to file the image and signal
Step 7: Display watermarked signal
Step 8: Read the watermarked signal to be used for recovering
Step 9: Determining size of Stego- image
Step 10: Use of LSB of Stego- image to recover watermark
Step 11: Scaling and displaying the recovered signal

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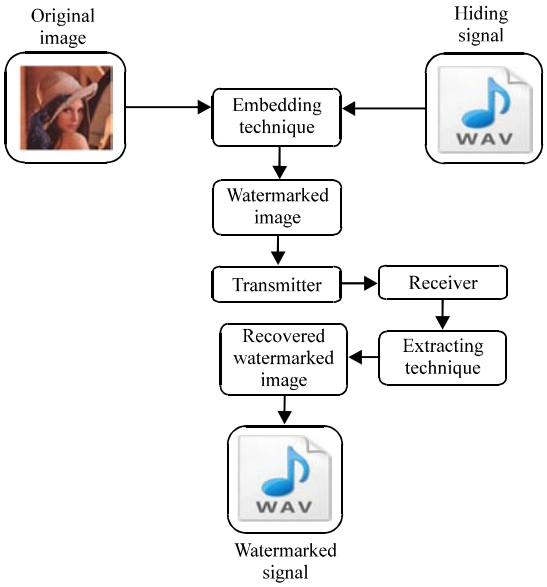

Fig. 1: Block diagram of proposed audio watermarking

Peak Signal-to-Noise Ratio (PSNR): PSNR is also good measurement for images and used to compare the quality of two images. It is used to calculate the quality of original watermark (binary image) and extracted watermark. PSNR is given by:

$$PSNR(dB) = -10\log_{10}\frac{MSE}{S^2}$$

Here, S is maximum pixel value.

Block diagram of the proposed method: Figure 1 shows the block diagram of proposed audio watermarking.

MATERIALS AND METHODS

In this study, time-spread echo-based audio watermarking method to increase the robustness and embedding capacity without significantly reducing the perceptual quality is proposed. Original image is embedding with the audio signal using LSB technique (Sundaram *et al*., 2014). Colour images, such as RGB images are comprised of three independent channels for the red, green and blue primary colour components. Using our technique, the embedding process is applied to one of the red, green or blue component. LSB method is used to hide the watermarked images. Finally, the watermarked images are transmitted to the receiver side of the extraction side (Mariappan *et al*., 2015). Then the watermarked images are extracted by using extraction technique. At last, the watermarked signal (Hidden signal) is recovered by the receiver (Fig. 1 and 2).

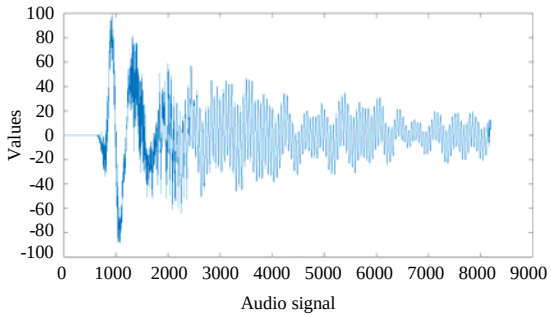

Fig. 2: Extracted audio signal from image

RESULTS AND DISCUSSION

The performance of the proposed system for digital audio watermarking using LSB technique was done. Invisible insertion of the watermark is performed in the most significant region of the host image such that tampering of that portion with an intention to remove or destroy will degrade the esthetic quality and value of the image. The obtained PSNR value is 3.023.

CONCLUSION

In this study, LSB has been proposed to watermark an audio signal to the image. The watermark embedding scheme can be extended to include encrypted watermarks. The extracted audio signal from an embedded image. First, the audio is embedding into the image. Then, the embedded image is used for the extraction process using LSB method. The results indicate that this performs better than the other distributions.

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